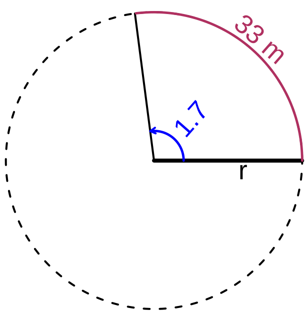
Name: Date:

Trig Final (Solution v12)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1.7 radians. The arc length is 33 meters. How long is the radius in meters?

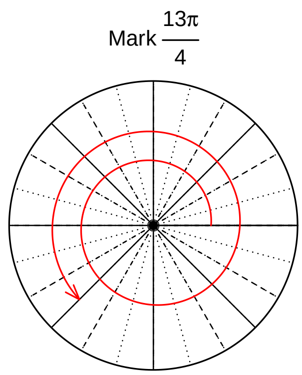


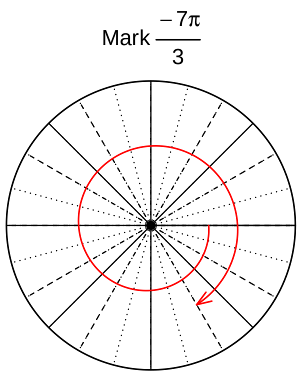
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 19.41$ meters.

Question 2

Consider angles $\frac{13\pi}{4}$ and $\frac{-7\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{13\pi}{4}\right)$ and $\sin\left(\frac{-7\pi}{3}\right)$ by using a unit circle (provided separately).





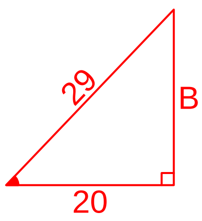
$\cos(13\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(-7\pi/3) = \frac{-\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{20}{29}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

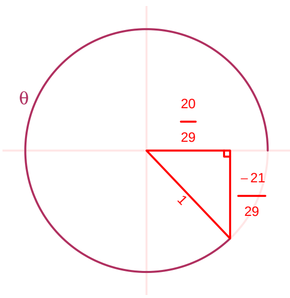
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$20^2 + B^2 = 29^2$$
$$B = \sqrt{29^2 - 20^2}$$
$$B = 21$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-21}{29}}{\frac{20}{29}} = \frac{-21}{20}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -2.15$ meters, an amplitude of 8.08 meters, and a frequency of 4.1 Hz. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 8.08\sin(2\pi 4.1t) - 2.15$$

or

$$y = 8.08\sin(8.2\pi t) - 2.15$$

or

$$y = 8.08\sin(25.76t) - 2.15$$